

**WHAT IS CLAIMED IS:**

1. A vehicle brake having a brake monitoring and sensor system attached to a brake shoe of a brake assembly; comprising:

a) a brake assembly for frictional braking of a vehicle;

5        b) said brake assembly including a brake shoe lining having a brake shoe and a brake pad for frictional engagement with said brake assembly; said brake shoe lining having first rivet openings with rivets therein, and having second rivet openings with no rivets therein;

      c) a sensor system having a first sensing element and a second sensing element each being connected to said brake shoe; said first sensing element being embedded in one or more  
10 of said first rivet openings with said rivets therein; said second sensing element being embedded in one or more of said second rivet openings having no rivets therein;

      d) said first sensing element for generating a first electrical signal in response to sensing changes in the temperature of said brake shoe generated by heat in said brake shoe, said heat being transmitted to one or more rivets in said first rivet openings;

15        e) said second sensing element for generating a second electrical signal in response to sensing a predetermined depth of wear of said brake pad; and

      f) a monitoring unit for processing said first and second electrical signals generated by said first and second sensing elements.

2. A vehicle brake monitoring and sensor system in accordance with Claim 1, wherein  
20 said first sensing element is a thermal sensor element.

3. A vehicle brake monitoring and sensor system in accordance with Claim 2, wherein said thermal sensor element includes a sensor housing member having a bottom wall at one end and a sensor threaded opening therethrough at the other end.

4. A vehicle brake monitoring and sensor system in accordance with Claim 3, wherein  
5 said sensor mounting opening is for receiving a threaded sensor sleeve.

5. A vehicle brake monitoring and sensor system in accordance with Claim 4, wherein said threaded sensor sleeve includes a flat tip end thereon.

6. A vehicle brake monitoring and sensor system in accordance with Claim 5, wherein said threaded sensor sleeve includes a proximal end and a distal end, said proximal end  
10 includes an attachment section for receiving a first electrical lead wire for generating said continuous first electrical signal in response to changes in the temperature of said rivets and said brake shoe.

7. A vehicle brake monitoring and sensor system in accordance with Claim 5, wherein said threaded sensor sleeve further includes an adjustment hex nut for adjusting said flat tip  
15 end of said threaded sensor sleeve within said opening of said sensor housing member in order to be in contact with said rivet within said first rivet openings of said brake shoe lining for measuring the changes in the temperature of said rivets and said brake shoe.

8. A vehicle brake monitoring and sensor system in accordance with Claim 1, wherein said second sensing element is a wear sensor detector element.

9. A vehicle brake monitoring and sensor system in accordance with Claim 8, wherein said wear sensor detector element includes a wear sensor housing member having a mounting  
5 head and a shaft with a shaft opening therein.

10. A vehicle brake monitoring and sensor system in accordance with Claim 9, wherein said shaft opening includes a proximal end and a distal end.

11. A vehicle brake monitoring and sensor system in accordance with Claim 9, wherein said shaft opening is used for receiving a compressible spring having a first end and  
10 a second end and a sensor tip ball in contact and adjacent to said first end of said compressible spring.

12. A vehicle brake monitoring and sensor system in accordance with Claim 10, wherein said proximal end of said shaft opening is for slidably receiving said sensor tip ball therein.

13. A vehicle brake monitoring and sensor system in accordance with Claim 10, wherein said distal end of said shaft opening is for receiving a contact pad and a switch member therein, such that one side of said contact pad is in contact with and adjacent to said second end of said compressible spring and the other side of said contact pad is in contact  
5 with and adjacent to said switch member.

14. A vehicle brake monitoring and sensor system in accordance with Claim 13, wherein said switch member includes a pair of electrical leads attached to said switch member.

10 15. A vehicle brake monitoring and sensor system in accordance with Claim 9, wherein said mounting head includes a surface having an electrical contact member with a contact base section and a contact pad section thereon.

16. A vehicle brake monitoring and sensor system in accordance with Claim 15, wherein said contact pad section includes a pair of electrical contact lead elements thereon.

15 17. A vehicle brake monitoring and sensor system in accordance with claim 16, wherein each of said lead elements include a threaded stem and a hex nut, respectively, thereon.

18. A vehicle brake monitoring and sensor system in accordance with Claim 9,  
wherein said shaft of said wear sensor detector element is received within said second rivet  
openings of said brake pad of said brake shoe lining.

19. A vehicle brake monitoring and sensor system in accordance with Claim 17,  
5 wherein each of said stems of said lead elements includes a second electrical lead wire and  
a third electrical lead wire, said second electrical lead wire for generating said second  
electrical signal in response to the wearing out of said brake pad of said brake shoe lining.

20. A vehicle brake monitoring and sensor system in accordance with Claim 19,  
wherein said third electrical lead is electrically connected to a power source for powering said  
10 wear sensor detector element.

21. A vehicle brake monitoring and sensor system in accordance with Claim 1,  
wherein said monitoring unit includes a plurality of digital brake temperature gauges having  
a reset button thereon.

22. A vehicle brake monitoring and sensor system in accordance with Claim 21,  
15 wherein said first electrical signal from said thermal sensor element gives a temperature  
reading of said rivet within said brake shoe of said brake shoe lining for viewing on said  
digital brake temperature gauge by an operator.

23. A vehicle brake monitoring and sensor system in accordance with Claim 1, wherein said monitoring unit includes a plurality of wear indicator lights and a plurality of wear indicator buzzers, respectively, thereon and being in series.

24. A vehicle brake monitoring and sensor system in accordance with Claim 23,  
5 wherein said second electrical signal from said wear sensor detector element provides a visual and auditory alarm to an operator from said wear indicator light and said wear indicator buzzer, respectively, when the wearing away of said brake pad of said brake shoe lining occurs.

25. A vehicle brake monitoring and sensor system in accordance with Claim 24,  
10 wherein said brake pads are worn away at said predetermined depth of wear of at least 1/8 of an inch above the rivet head of said rivets within said brake pad of said brake shoe lining in order to allow said visual and auditory alarm to take place on said monitoring unit.

26. A vehicle brake monitoring and sensor system in accordance with Claim 9,  
wherein said shaft of said wear sensor detector element further includes a detachable spacer  
15 having a spacer opening therethrough in order to adjust for said predetermined depth of wear.

27. A vehicle brake monitoring and sensor system in accordance with Claim 26, wherein said spacer is in contact with and adjacent to said mounting head of said wear sensor detector element and inner brake shoe surfaces of said brake shoes for adjusting said predetermined depth of wear of said sensor detector elements within said brake shoes.

5           28. A vehicle brake monitoring and sensor system in accordance with Claim 1, wherein said first sensing element for generating no electrical signal when said brake assembly is not in contact with said brake pad.

10           29. A method of monitoring the temperature and wear of a brake shoe lining of a brake assembly, the brake assembly includes a brake shoe lining having a brake shoe and a brake pad for frictional engagement with the brake assembly; the brake shoe lining has first rivet openings with rivets therein, and has second rivet openings with no rivets therein; a sensor system having a first sensing element and a second sensing element each being connected to the brake shoe; and a monitoring unit for detecting the temperature and wear of the brake shoe lining, comprising the steps of:

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          a) embedding said first sensing element in one or more of said first rivet openings with said rivets therein;

b) embedding said second sensing element in one or more of said second rivet openings having no rivets therein;

c) actuating by an operator said brake assembly on said brake shoe lining for frictional braking of a vehicle;

5 d) generating a first electrical signal from said first sensing element;

e) sensing changes in the temperature of said brake shoe generated by heat on said brake shoe;

f) transmitting said first electrical signal from one or more rivets in said first rivet openings from heat generated by said rivets and said brake shoe to said monitoring unit;

10 g) generating a second electrical signal from said second sensing element;

h) sensing a predetermined depth of wear of said brake pad;

I) transmitting said second electrical signal in response to said sensing of said predetermined depth of wear of said brake pad to said monitoring unit; and

j) processing said first and second electrical signals generated by said first and  
15 second sensing elements for displaying a visual and an auditory alarm to the operator on said monitoring unit.



30. A method of monitoring in accordance with Claim 29 further including the step of:

a) placing said second sensing element at said predetermined depth of wear of at least  $\frac{1}{8}$  of an inch above the rivet head of said rivets within said brake pad of said brake shoe lining in order to allow said visual and said auditory alarm to take place on said monitoring unit.